**WHAT IS CLAIMED IS:**

1. A radio communication system comprising first and second radio communication apparatuses which can communicate with each other by radio,

wherein said first radio communication apparatus comprises:

a propagation path environment estimator which outputs, as propagation path environment information, a result of estimation of an environment of a propagation path to said second radio communication apparatus on the basis of a signal from said second radio communication apparatus;

a propagation path quality estimator which outputs, as propagation path quality information, a result of estimation of quality of the propagation path to said second radio communication apparatus on the basis of the signal from said second radio communication apparatus; and

transmitting means for transmitting the propagation path environment information and propagation path quality information together with a data signal to said second radio communication apparatus,

and wherein said second radio communication apparatus comprises:

a transmission mode selector which includes a plurality of tables in which a plurality of transmission modes each having a threshold value corresponding to a

value of the propagation path quality information are registered, selects one of said plurality of tables in accordance with the propagation path environment information, and selects, as a mode for transmission to said first radio communication apparatus, one of the transmission modes registered in the selected table in accordance with the propagation path quality information.

2. A radio communication system according to claim 1,

wherein said first radio communication apparatus comprises an error detector which detects an error in the signal from said second radio communication apparatus and outputs the error as an error detection result,

wherein said transmitting means transmits the propagation path environment information, propagation path quality information, and error detection result together with a data signal to said second radio communication apparatus, and

wherein said transmission mode selector of said second radio communication apparatus rewrites, in accordance with the error detection result, a threshold value registered in the table to correspond to the selected transmission mode.

3. A radio communication system according to claim 1, wherein the path count is used as the propagation path environment information.

4. A radio communication system according to claim 3, wherein a plurality of tables correspond to path counts P1, P2,..., PR (P1, P2,..., PR are natural numbers and satisfy P1 < P2 < ... < PR).

5. A radio communication system according to claim 1, wherein a maximum Doppler frequency is used as the propagation path environment information.

6. A radio communication system according to claim 5, wherein a plurality of tables correspond to maximum Doppler frequencies f0, f1,..., fR-1 (f0 < f1 < ... < fR-1), and, with respect to a threshold value xi (xi is an arbitrary number which satisfies fi < xi < fi+1, and i is an integer from 0 to R - 2), if a maximum Doppler frequency fd is xj-1 < fd ≤ xj (j is an integer from 1 to R - 2), fj is selected as the maximum Doppler frequency, if fd ≤ x0, f0 is selected as the maximum Doppler frequency, and if fd > xR-2, fR-1 is selected as the maximum Doppler frequency.

7. A radio communication system according to claim 1, wherein a delay dispersion is used as the propagation path environment information.

8. A radio communication system according to claim 7, wherein a plurality of tables correspond to delay dispersions σ0, σP,..., σq-1 (σ0 < σ1 < ... < σR-1), and,

with respect to a threshold value xi (xi is an arbitrary value which satisfies $\sigma i < xi < \sigma i+1$, and i is an integer from 0 to R - 2), if a delay dispersion $\sigma$ is $xj-1 < \sigma \leq xj$ (j is an integer from 1 to R - 2), $\sigma j$ is selected as the delay dispersion, if $\sigma \leq x0$, $\sigma 0$ is selected as the delay dispersion, and if $\sigma > xR-2$, $\sigma R-1$ is selected as the delay dispersion.

9. A radio communication system according to claim 1, wherein a plurality of selection tables correspond to combinations of path counts P1, P2,..., PJ (P1, P2,..., PJ are natural numbers not more than R and satisfy P1 < P2 < ... < PJ) and maximum Doppler frequencies f0, f1,..., fK-1 (K is a natural number not more than R and satisfies J × K = R).

10. A radio communication apparatus according to claim 1, wherein a plurality of tables correspond to combinations of path counts P1, P2,..., PJ (P1, P2,..., PJ are natural numbers and satisfy P1 < P2 < ... < PJ) and delay dispersions $\sigma 0$, $\sigma P$,..., $\sigma k-1$ (L is a natural number not more than R and J × L = R) (if the path count is 1, the delay dispersion is not used as the propagation path environment information).

11. A radio communication system according to claim 1, wherein a plurality of tables correspond to combinations of

maximum Doppler frequencies f0 to fK-1 and delay dispersions σ0 to σL-1 (L is a natural number not more than R and K × L = R).

12. A radio communication system according to claim 1, wherein a plurality of tables correspond to combinations of path counts P1, P2,..., PJ, maximum Doppler frequencies f0 to fK-1, and delay dispersions σ0 to σL-1 (J, K, L, and R are natural numbers which satisfy J × K × L = R) (if the path count is 1, the delay dispersion is not used as the propagation path environment information).

13. A radio communication system according to claim 1, wherein a signal-to-interference ratio is used as the propagation path quality information.

14. A radio communication system according to claim 1, wherein a signal-to-noise ratio is used as the propagation path quality information.

15. A radio communication system according to claim 2, wherein a modulation technique is used as a parameter of a transmission mode.

16. A radio communication system according to claim 2, wherein an encoding ratio is used as a parameter of a transmission mode.

17. A radio communication system according to claim 1, wherein a transmission power is used as a parameter of a transmission mode.

18. A transmission mode selection method performed in a radio communication system comprising first and second radio communication apparatuses which can communicate with each other by radio, wherein the method comprises:

the first step, performed by the first radio communication apparatus, of estimating propagation path environment information indicating an environment of a propagation path to the second radio communication apparatus on the basis of a signal from the second radio communication apparatus;

the second step, performed by the first radio communication apparatus, of estimating propagation path quality information indicating quality of the propagation path to the second radio communication apparatus on the basis of the signal from the second radio communication apparatus;

the third step, performed by the first radio communication apparatus, of transmitting the propagation path environment information and propagation path quality information together with a data signal to the second radio communication apparatus; and

the fourth step, performed by the second radio communication apparatus, of selecting, in accordance with

the propagation path environment information, one of a plurality of tables in each of which a plurality of transmission modes each having a threshold value corresponding to a value of the propagation path quality information are registered, and selecting, as a mode for transmission to the first radio communication apparatus, one of the transmission modes registered in the selected table in accordance with the propagation path quality information.

19. A transmission mode selection method performed in a radio communication system comprising first and second radio communication apparatuses which can communicate with each other by radio, wherein the method comprises:

the first step, performed by the first radio communication apparatus, of estimating propagation path environment information indicating an environment of a propagation path to the second radio communication apparatus on the basis of a signal from the second radio communication apparatus;

the second step, performed by the first radio communication apparatus, of estimating propagation path quality information indicating quality of the propagation path to the second radio communication apparatus on the basis of the signal from the second radio communication apparatus;

the third step, performed by the first radio

communication apparatus, of obtaining an error detection result indicating an error in the signal from the second radio communication apparatus;

the fourth step, performed by the first radio communication apparatus, of transmitting the propagation path environment information, propagation path quality information, and error detection result together with a data signal to the second radio communication apparatus; and

the fifth step, performed by the second radio communication apparatus, of selecting, in accordance with the propagation path environment information, one of a plurality of tables in each of which a plurality of transmission modes each having a threshold value corresponding to a value of the propagation path quality information are registered, selecting, as a mode for transmission to the first radio communication apparatus, one of the transmission modes registered in the selected table in accordance with the propagation path quality information, and rewriting, in accordance with the error detection result, a threshold value registered in the table to correspond to the selected transmission mode.